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Alfalfa - Fertilizer Needs

R.C. McKenzie

Does alfalfa require fertilizer? During the past six years, research by soils and water staff at Brooks, with assistance from R.H. McKenzie, AAFRD, Lethbridge, and L. Kryzanowski, AAFRD, Edmonton, has been directed at identifying the fertilizer requirements of irrigated alfalfa.

Southern Alberta has about 320,000 acres of irrigated forage alfalfa and about 64,000 acres of cereal crops under-seeded to alfalfa. This represents about 30% of the total irrigated area. Alfalfa is recognized as a crop which improves soil fertility and tilth and controls annual weeds. Because of alfalfa's reputation as a crop that improves soil fertility, farmers often do not fertilize irrigated alfalfa. Also, applications of fertilizer to alfalfa may not show visible results. Farmers usually apply less nitrogen fertilizer to cereal crops grown in the first one or two years after alfalfa.

However, alfalfa forage requires and removes large quantities of nutrients from the soil. In one year, an average crop of alfalfa (4 1/2 tons/acre) removes from the soil 27 lbs of phosphorus per acre and 220 lbs of potassium per acre. In contrast, the grain from an average crop of wheat (60 bu/acre) removes from the soil 15 lbs of phosphorus and 21 lbs of potassium per acre.

From 1989 to 1993, 98 randomly selected irrigated fields in the Brooks, Vauxhall and Bow Island areas were sampled. The survey indicated the rates of fertilizer supplied to alfalfa were much less than crop removals of nutrients.

Only 29% of the farmers applied, during the life of the stand, sufficient phosphorus (50 lbs/acre P_2O_5 or 22 lbs/acre P) to provide for most of one year's crop removal, 14% of farmers applied small amounts of potassium and the rest did not apply any. Nitrogen, other than ammonium phosphate, was applied to alfalfa by 34% of farmers, but most of this was applied to cover crops during the establishment year. Manure was applied to 9% of the alfalfa fields surveyed.

Soil and plant tissue samples from the 98 fields were analyzed to determine nutrient status. Since soil test limits were developed in Alberta under mostly dryland conditions, they are not reliable on high

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Manure - An Excellent Low Cost Fertilizer

Ross H. McKenzie

Commercial fertilizer prices have dramatically increased over the past two years. Last spring many farmers complained bitterly about the rising costs of fertilizers. One alternative, if you have a feedlot or other type of intensive livestock operation within hauling distance of your farm, is to use manure to beat the rising cost of commercial fertilizers.

Manure is a good source of nutrients. For example, the nitrogen (N), phosphate (P_2O_5) and potassium (K_2O) content of feedlot manure, with bedding, is about 21, 18 and 26 lb/ac per ton at a moisture content of 50%. Other plant nutrients such as calcium, magnesium, copper, manganese, iron and zinc are contained in manure. Nutrient levels in manure can vary dramatically depending on the type of animal manure and environmental conditions during storage and handling. Table 1 provides some general information on types of manures and approximate nutrient levels.

For feedlot manure, about 40 to 50% of the N and P_2O_5 are released for plant uptake during the growing season in the year of application. The remaining nutrients are released in subsequent years.

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Alberta

AGRICULTURE, FOOD AND RURAL DEVELOPMENT

Manure - Continued

Table 1. Approximate dry matter and fertilizer nutrient composition of various animal manures.

Type of Livestock	Waste Handling System	Dry Matter (%)	Nutrient (lb/ton raw waste) Nitrogen Available	Total	P_2O_5	K_2O
Swine	Without bedding	18	6	10	9	8
	With bedding	18	5	8	7	7
Beef Cattle	Without bedding	15	4	11	7	10
	With bedding	50	8	21	18	26
Dairy Cattle	Without bedding	18	4	9	4	10
	With bedding	21	5	9	4	10
Poultry	Without litter	45	26	33	48	34
	With litter	74	36	56	45	34
	Deep pit (compost)	76	44	68	64	45

Source Sutton et al. Purdue Uni. ID - 101 (1975)

If we assume that N, P_2O_5 and K_2O have values of 35¢, 30¢ and 20¢/lb respectively, then the approximate value of one ton of feedlot manure is $17.95. If manure was applied at a rate of 10 tons per acre, the value of nutrients applied in the manure would be $179.50 per acre. The total amounts of N, P_2O_5 and K_2O added would be 210, 180 and 260 lb/ac. Keep in mind, however, that only half of these nutrients will be available in the year of application. A 10 ton/ac application rate should provide enough nutrients in the year of application to meet the nutrient requirements of an 80 - 100 bu/ac barley crop.

The cost of delivery and spreading of manure is between $3.00 and $5.00 per ton depending on the hauling distance. At a 10 ton/ac application rate, the total cost per acre of the manure would be $30.00 to $50.00. This is excellent value for your fertilizer dollar considering that about $180/ac of nutrients are added to the soil.

Continued use of manure has other benefits besides adding nutrients to soil. Manure will increase the organic matter content of the soil. This results in a number of physical improvements in soil quality which include:

1. Increased water holding capacity of the soil.
2. Improved soil structure and tilth of the soil.
3. Improved soil structure makes the soil less susceptible to wind and water erosion.
4. Increased water infiltration rates which will reduce water runoff
5. Reduced soil crusting problems.

Other advantages of manuring include:

1. Higher levels of carbon dioxide occur in dense crop canopies that have restricted air movement.
2. Soil has increased buffering capacity against fluctuations in pH.

Producers that are within 5 to 8 miles of a confined livestock operation, should consider using manure as a fertilizer source. Operators of confinement livestock operations are occasionally faced with the problem and cost of disposing of manure. The potential to purchase manure by paying for delivery and spreading has a double benefit. The confinement operator can dispose of extra manure and a nearby neighbour has the advantage of an excellent source of fertilizer by simply paying for transportation costs. When neighbouring farmers can take advantage of win-win situations like this, the whole agricultural community benefits!

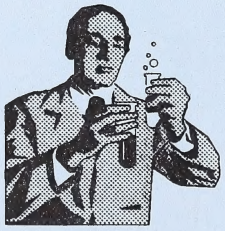
Ross H. McKenzie, Research Scientist - Soil Fertility, Lethbridge. (403) 381-5126

♧ The Power of Pursuasion ♧

From *"How To Convince A Reluctant Scientist"*, Scientific American, January 1995. Author *John Timpane* (By permission of the author. I.R. Evans).

"Prestige sells, too. Freeman Dyson has noted the 'profound consequences' of status in the sciences. A famous team at a famous institution backed by famous money is a hard combination to resist".

"The law of obviousness, better to be a half-step ahead and understood than a whole step and ignored".



"Many scientists believe arguments they have never read or heard, simply because most of their peers believe".

"In the sciences as elsewhere, conviction involves other forces, both reason and nonreason. Much of what makes a scientific argument convincing, in the end, has to do with things other than science. By saying so, we do not impugn or undermine the sciences so much as we recognize their humanity".

Alfalfa - Continued

pH irrigated soils. Tissue test values from USA were used. These have not been evaluated under irrigated conditions in Alberta.

Soil test nitrogen was low on 96%, marginal on 2% and adequate on 2% of fields sampled. Tissue nitrogen was adequate on 99% and low on 1% of fields. This means that despite the low levels of soil nitrogen and limited amounts of nitrogen fertilizer, the alfalfa plants were obtaining nitrogen from the air and soil by nitrogen fixation.

The soil test results revealed that phosphorus was deficient on 71% of fields, marginal on 18% and adequate on 11%. However, tissue test results revealed that phosphorus was low on 44% and adequate on 56% of fields. Fields with adequate soil phosphorus yielded 36% more and fields which were marginal yielded 20% more than fields which were deficient. Fields with adequate tissue phosphorus yielded 16% more than fields which were deficient. More research is needed to determine whether soil or tissue tests are the most reliable indicators of a need for phosphorus fertilizer.

Soil test results revealed that potassium was not deficient of any fields, marginal on 12% and adequate on 88% of fields. The fields that tested adequate in soil potassium yielded 6% more than fields that were marginal. Tissue test potassium was low on 79% of fields and adequate on 21%. However, the fields that tested sufficient in tissue potassium yielded only 2% more than those that tested low. This means that there was a discrepancy between soil and tissue potassium values.

In 1994, irrigated field experiments were set out in southern Alberta to test rates of phosphorus and nitrogen at six sites, and potassium at three sites. These field experiments will be continued throughout 1995 and 1996.

To further examine soil tests, five different methods were used to test soil phosphorus. The results are not conclusive, but at two sites the Kelowna method or variations of it developed by Norwest Lab in Edmonton or the Plains Innovative Lab in Saskatchewan appear to be more reliable than the conventional Miller Axley method. However, on two of the six sites, none of the methods indicated any difference in the amount of phosphorus available in the soil.

Broadcast applications of phosphorus or potassium fertilizers were equally effective as shallow banding. This is useful to farmers as it means it is not difficult to provide phosphorus or potassium fertilizer to established alfalfa crops.

Both phosphorus and potassium fertilizer gave appreciable increases in yield at some of the sites. Amounts of soil potassium measured were much higher by some analytical methods than by others on two of the three research sites.

Rates of nitrogen fertilizer were tested at all sites. Some increase in yield occurred in the first cut after application of 86 lbs/acre nitrogen but 29 lbs/acre of nitrogen did not make a measurable change in yield. The effect of spring nitrogen applications did not persist beyond the first harvest.

More research is needed to establish methods for predicting phosphorus and potassium fertilizer responses. At present, the best alternative for a farmer is to rely on a combination of soil and tissue analysis. If the soil has a high pH value (above 7.8), the Kelowna methods of analysis for soil phosphorus are more reliable than the more traditional Miller Axley method.

R.C. McKenzie, Soil and Water Specialist, Brooks (362-3391)

Is Organic Farming an Answer to Groundwater Nitrate Pollution?

Ieuan R. Evans

Many organic growers believe that if they don't use "artificial fertilizers" they can continue farming without worrying about environmental issues such as nitrates leaching into the groundwater. Groundwater contamination by nitrates occurs when that portion of nitrogen not used by the crop leaches down the soil profile into the groundwater.

Organic farmers use legumes to produce (fix) "organic" nitrogen. A good crop of peas or alfalfa can fix perhaps 60 or more pounds per acre of "organic" nitrogen. In order for this nitrogen to be fully used, it must be properly balanced with P, K or S including secondary macronutrients (Ca and Mg) and micronutrients such as Cu or Zn. For example, a crop grown on a phosphorus deficient soil can only use a small portion of the available nitrogen. The unused nitrogen can then leach into the groundwater and find its way into ponds, streams or artesian wells.

Fallowing of soil for weed control also results in the release of nitrogen from the soil organic matter. A soil with 7% organic content contains 7,000 lbs of N/acre. During a single growing season perhaps 100 lbs of this nitrogen may be released into the soil following fallow cultivation. Since at the time of fallowing there is no crop to use up the nitrogen, this nitrogen just like "artificial" nitrogen can leach into the subsoil and contribute to groundwater pollution problems.

Organic farmers must then ensure that a proper soil balance of nutrients exists or are added to the soil, to avoid this loss of legume fixed nitrogen. If many other macro or micronutrients are in short supply then much of the available N could become surplus. Reducing the number of tillage passes decreases the amount of nitrogen released from the soil.

Excess organic nitrogen will cause the same pollution problems as excess "artificial" nitrogen. Organic farmers must be every bit as vigilant as conventional farmers when it comes to soil nutrient management.

Ieuan R. Evans, Plant Pathologist, Edmonton (427-7098)

You are Invited to Visit
Research Plots for the 1995 Summer Growing Season
For further information on the following plots contact:
Agronomy Unit, Edmonton at 427-2530 or Agronomy Unit, Lethbridge at 381-5126

Funding Agencies Include:

Alberta Agriculture Agronomy Unit
Alberta Agricultural Research Institute
Farming For The Future
Alberta Barley Commission
Alberta Canola Producers Commission
Potash and Phosphate Institute
Western Grains Research Foundation
Canada Alberta Environmental Sustainable Agreement
Alberta Pulse Growers Commission
Alberta Winter Wheat Growers Commission
Cominco Biologicals
Westco
Agrium
Philom Bios
Sherritt
DowElanco

1995 Agronomy Unit Research Sites - Lethbridge Group

Key Contact	Area	Legal Location	Co-operator	Soil Zone
Winter Wheat Trials				
Ross McKenzie	Bow Island	SW18-9-10-W4	T. Doran	Brown
Ross McKenzie	Barons	SE20-12-23-W4	D. Johnson	Dark Brown
Ross McKenzie	High River	SW26-18-28-W4	F. Randle	Thin Black
Ross McKenzie	Pincher Creek	SE11-6-29-W4	L. Sproule	Thin Black
Direct Seeding Trials - Wheat, Barley and Canola				
Ross McKenzie	Bow Island	SW18-9-10-W4	D. Doran	Brown
Ross McKenzie	Coaldale	NW34-9-20-W4	I. Lanier	Dark Brown
Ross McKenzie	Barons	SE20-12-23-W4	D. Johnson	Dark Brown
Ross McKenzie	High River	SW26-18-28-W4	F. Randle	Thin Black
Ross McKenzie	Pincher Creek	SE11-6-29-W4	L. Sproule	Thin Black
Barley Silage Trials				
Ross McKenzie	Bow Island	SE17-9-11-W4	Substation	Brown
Ross McKenzie	Coaldale	SE20-2-20-24	G. Klassen	Dark Brown
Ross McKenzie	Lethbridge	SW18-10-20-W4	A. Englse	Dark Brown
Ross McKenzie	Barons	SE20-12-23-24	D. Johnson	Dark Brown
Ross McKenzie	Strathmore	NE23-24-24-W4	B. Barnett	Dark Brown
Ross McKenzie	High River	SW26-18-28-W4	F. Randle	Thin Black
Ross McKenzie	Pincher Creek	SE11-6-29-W4	L. Sproule	Thin Black
Long-Term Trials				
Ross McKenzie	Bow Island	SE17-9-11-W4	Substation	Brown
Ross McKenzie	Bow Island	SE17-9-11-W4	Substation	Brown
Ross McKenzie	Carmangay	SW32-12-21-W4	R. Svanes	Dark Brown
Ross McKenzie	Pincher Creek	SE11-6-29-W4	L. Sproule	Thin Black
Dryland Long-Term				
Ross McKenzie	Carmangay	SW32-12-21-W4	R. Svanes	Dark Brown
Pea Trials				
Ross McKenzie	Bow Island	SE17-9-11-W4	Substation	Brown
Ross McKenzie	Coaldale	SE20-9-20-W4	G. Klassen	Dark Brown
Ross McKenzie	Lethbridge	SW18-10-20-W4	A. Englse	Dark Brown
Ross McKenzie	Barons	SE20-12-23-W4	D. Johnson	Dark Brown
Ross McKenzie	Strathmore	NE23-24-24-W4	B. Barnett	Dark Brown
Ross McKenzie	High River	SW26-18-28-W4	F. Randle	Thin Black
Ross McKenzie	Pincher Creek	SE11-6-29-W4	L. Sproule	Thin Black
Bean Trials				
Ross McKenzie	Bow Island	SE17-9-11-W4	Substation	Brown
Ross McKenzie	Taber	SE11-11-16-W4	N. Milo	Brown
Ross McKenzie	Coaldale	NE35-8-20-W4	J. Machlielse	Dark Brown

1995 Agronomy Research Sites - EdmontonGroup				
Site	**Legal Location**	**Cooperator**	**Experiments**	**Key Contact**
Barrhead	NE17-59-3-W4	Len Arndt	Pea Production	Ross McKenzie
			Barley Silage	Ross McKenzie
			Optimal Seed - CORE I &III - Barley	Elston Solberg
			Seedplaced Experimental Urea	Doon Pauly - Sherritt/Elston Solberg
			Phosphorus Sources	Elston Solberg/Marvin Nyborg
Beaumont	NW15-50-24-W4	Dan Goudreau	Preseed Burnoff	Denise Maurice
Calmar	NW35-49-27-W4	Jerome/Meron Lickacz	Optimal Seed - CORE I &III - Barley/Canola	Elston Solberg
Cooking Lake	SE3-51-21-W4	Cliff Horricks	Simulated Erosion	Elston Solberg
			Longterm Phosphorus	Ross McKenzie
Ellerslie Soils		U of A Farm	Pea Production	Ross McKenzie
		Dept of Ren. Resources	Barley Silage	Ross McKenzie
			Phosphorus Sources	Elston Solberg/Marvin Nyborg
			Coated Nitrogen & Phosphorus	Elston Solberg/Marvin Nyborg
			Ceres	Len Kryzanowski
			High Protein Wheat	Elston Solberg
			Diagnostic Field School	E.Solberg/Denise Maurice/ Ieuan Evans
			Nitrogen X Variety	Jerome Lickacz
Josephburg	NE19-54-21-W4	Doug/Elsie Gabert	Simulated Erosion	Elston Solberg
			Longterm Phosphorus	Ross McKenzie
Lacombe	NW3-40-24-W4	W.C. Glen	Pea Production	Ross McKenzie
			Barley Silage	Ross McKenzie
			Optimal Seed - CORE I &III - Canola	Elston Solberg
			Mini Diagnostic Field School	Elston Solberg
		Field Crop Dev. Centre	Ceres Plot	Len Kryzanowski
Leduc	SE26-50-26-W4	Gerry Chamulka	Copper: Rate X Source X Method	Elston Solberg
			PowerRich	Elston Solberg
			Cu X Peas	Elston Solberg
			Cu X Flax	Elston Solberg
			Cu X Herbicide	Elston Solberg
			Cu Source X Manure Source	Elston Solberg/Roger Andreuik
	NE2-50-26-W4	Dan Borys	Copper: Rate X Source X Method (modified)	Elston Solberg
			Cu Source X Manure Source	Elston Solberg/Roger Andreuik
			Copper X Oats	Elston Solberg
Ft. Saskatchewan	on 34 St. between 167 & 195 Ave.	Lee Speers	Optimal Seed - CORE I &III - Barley/Canola	Elston Solberg
			Preseed Burnoff	Denise Maurice
Millet	NE11-47-25-W4	Marvin Nakonechny	Barley Silage	Ross McKenzie
			Phosphorus Sources	Elston Solberg
			Coated Nitrogen & Phosphorus	Elston Solberg
Spruce Grove	NW31-52-26-W4	Lewis Farms Ltd	Copper: Rate X Source X Method	Elston Solberg
			Copper X Nitrogen X Oats	Elston Solberg
			Copper X Smut	Ieuan Evans
			Copper X Peas	Elston Solberg
			PowerRich	Elston Solberg
	NE25-52-27-W4	Lewis Farms Ltd.	Copper: Rate X Source X Method	Elston Solberg
			Copper X Nitrogen X Oats	Elston Solberg
			Copper X Smut	Ieuan Evans
			PowerRich	Elston Solberg
Vegreville	NE21-52-15-W4	Roger Welsh	Pea Production	Ross McKenzie
Viking	SW36-47-13-W4	Andrukow Farm Sales	Pea Production	Ross McKenzie

Winter Wheat Fertilizer Project

Ross H. McKenzie and Allan Middleton

In 1994, the Agronomy Unit of Alberta Agriculture initiated a research study to examine the effects of conventional versus direct-seeding to establish winter wheat and to determine the effects of seed-placed nitrogen fertilizer in the fall versus broadcasting in the spring. The study will be conducted for at least three years.

Two sites were established in 1994 at Lethbridge and Bow Island. The treatments used were split to look at fertilizer applied at the time of seeding (Core 1) and fertilizer applied in spring (Core 2) (Table 1). The Core 1 fertilizer treatments had three placement methods: banded prior to seeding (conventional tillage), applied with the seed using a 2 cm (3/4 inch) narrow opener (direct seeded) and applied with the seed using a 10 cm (4.0 inch) opener (direct seeded). The Core 2 fertilizer treatments were all direct seeded using either a 3/4 inch narrow opener or a 4.0 inch opener. All phosphate fertilizer was applied with the seed at the time of seeding.

Results at Bow Island and Lethbridge showed that plant populations in treatments where nitrogen was banded were reduced by about 10 - 30% compared with direct-seeded treatments. The banding operation prior to seeding had a negative effect on seedbed quality.

Soils at the Bow Island site were very nitrogen deficient with only 10 kg/ha (9 lb/ac) of nitrogen in the top 60 cm (24 inches) of soil. Results at Bow Island showed that winter wheat was highly responsive to nitrogen fertilizer even at the 90 kg/ha (81 lb/ac) rates. Winter wheat response to nitrogen fertilizer at Lethbridge peaked at 30 kg/ha (27 lb/ac). Soils at this site were higher in both nitrogen and organic matter from being in a continuously-cropped/direct-seeded crop rotation.

Core 1 results at Bow Island showed that seed-placed urea (U) with either the narrow or 4 inch opener at 90 kg/ha reduced yields by 15 - 20% compared with the banded treatment. There was no injury with seed-placed ammonium (AN) nitrate. Seedbed soil moisture conditions at the time of seeding were very good. At Lethbridge, banded nitrogen treatments tended to produce slightly higher yields than the same rates placed with the seed, although yield differences were small. The 90 AN and 90U seed-placed treatments did not significantly reduce yields compared with other treatments, although there were reductions in plant populations. Seedbed soil moisture conditions at the time of seeding were very good to excellent. Surprisingly, there was no significant response to phosphate fertilizer at either site, when adequate nitrogen fertilizer was applied.

The highest yielding Core 2 treatments at Bow Island were the split application treatments of 30AN(fall)/ 30AN(spring) and 30U(fall)/ 30U(spring). However, none of the Core 2 treatments yielded as well as the Core 1 90 kg/ha treatments that were fall applied. Spring broadcast ammonium nitrate treatments generally were 10 - 20% higher yielding than respective urea treatments.

The 1994 results suggest that higher rates of N fertilizer, whether seed-placed or banded, had little effect on winter hardiness or over-winter survival. Fall banded or seed-placed nitrogen fertilizer resulted in higher winter wheat yields than spring broadcast fertilizer at Bow Island. There was little difference in winter wheat yields in fall applied N treatments versus spring broadcast treatments at Lethbridge.

In the fall of 1994, four new sites were established at Bow Island, Barons, High River and Pincher Creek, for the 1995 crop year. Fertilizer treatments are the same as 1994 plots except a Core 3 block of four anhydrous ammonia treatments (0, 30, 60 and 90 kg/ha) were added at all locations except High River. These treatments were done in cooperation with the Alberta Farm Machinery Research Centre.

Funding for 1995 research is from the Alberta Agricultural Research Institute, FFF On-Farm Demonstration Program, Sherritt, Alberta Winter Wheat Producers Commission, Potash and Phosphate Institute and Westco.

Table 1. Core 1 and 2 fertilizer treatments.

Core 1		Core 2		
Nitrogen	Phosphate	Nitrogen/Fall	Nitrogen/Spring	Phosphate
kg/ha			kg/ha	
0	0	0	0	20
0	20	0	30	20
30AN	0	30AN	30	20
30AN	20	0	60	20
60AN	20	0	90	20
90AN	20	0	30	20
30U	20	30U	30	20
60U	20	0	60	20
90U	20	0	90	20

AN = ammonium nitrate (34.5-0-0) U = urea (46-0-0)

Ross H. McKenzie and Allan Middelton, Lethbridge 381-5126

Logical answers to perplexing questions

Ieuan R. Evans

On a June 14, 1995 tour with the Pembina Forage Association several items of interest were observed.

An excellent take of Alfalfa undersown with canola in 1994 (30 bu/acre crop) showed severe damage in strips coinciding with the 2-3' wide swaths of canola residue. Where the residue was heaviest, the undersown alfalfa had been killed-off the previous fall. There was however a very good take where the residue was lighter, particularly along the edges of the canola residue strip. The alfalfa in and along the edges of these strips was much paler green and up to 40% of the foliage showed severe browning (necrosis).

After discussion it was deduced that this was not phytotoxicity by canola residue but frost injury. The black soil was warmer and released heat that protected the alfalfa from the -5° to °-7 C temperatures that occurred around May 27th. The insulating properties of the canola residue (colder soil, slower growth) resulted in lower temperatures and frost injury. What really clinched the frost injury conclusion was the fact that sowthistle growing on or very near the canola residue showed frost injury whereas that which emerged in the "black soil" had no damage. It is likely that some of the injured and non-injured sow thistle at both locations was part of the same clone i.e. linked-up by horizontal creeping root systems.

Under similar conditions involving minimum or zero tillage we could perhaps expect the same injury (frost) pattern on spring sown cereals. Researchers in Saskatchewan in previous years have failed to show any crop phytotoxicity from canola residues. Perhaps what we've previously assumed to be phytotoxicity has been differential frost injury all along.

This information has implications to canola and other crops sown on minimum tillage land with lots of straw residue. Black soil may prevent canola, cereal or other crops from freezing. Can spring seeded crops withstand much colder air temperatures on black soil than those with high residue levels?

In Westco's Agromanager, February 1995, a Manitoba canola grower has already recognized this problem. He found that planting canola into full residue fields was extremely risky in terms of frost. He understood that it wasn't just the fact that the soil was cooler - the primary problem was there was less upward radiation of heat to protect the emerging seedlings from frost injury.

At another alfalfa field on this same Forage Tour a line of bleached, damaged canola about 4-6" wide was observed to run from the ditch right across the field. This line of severely damaged alfalfa was more or less straight. The deduced answer was that those were coyote tracks - the animal had passed through the field in the early morning when the alfalfa was frozen. Again this would have happened around May 27th. The alfalfa plants were likely supercooled - just like water in the freezer. A bang, or jolt will cause supercooled water to freeze. The alfalfa froze where it was touched or disturbed. The lesson here is don't "handle" your crops when they are frozen. This was reinforced by Allan MacCaulay, Forage Specialist at Westlock. Allan said that when he treated quack grass with Roundup last fall the grass was frozen. The kill was good except for the wheel tracks where the quack grass grew back. It appears that the frozen quack was killed by the tractor wheels and consequently was not receptive to the herbicide. Another "wheel track" story.

The final note on the forage tour is that an alfalfa crop under drought conditions will quickly show you where the solonetzic hard pans occur in the field. It will also show up cracks in these pans that allow alfalfa roots to grow into deeper subsoil. On such soils, in drought years, there may be huge differences in alfalfa growth (height) in the crop from severely dwarfed to normal.

Ieuan R. Evans, Plant Pathologist, Edmonton 427-7098

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SOILutions
Alberta Agriculture, Food and Rural Development
905, 6909 - 116 Street, Edmonton, Alberta, T6H 4P2

Marilyn Touchette
Phone 427-6361, Fax 427-1439

Or

Joan Seath
Phone 427-2530, Fax 427-0133

Alberta Agriculture, Food and Rural Development
Agronomy Research Unit
Main Floor, O.S. Longman Building
6909 - 116 Street
Edmonton, AB., T6H 4P2

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Pointing the Way Around Rural Alberta

Travellers on secondary highways and rural roads often need more information than large-scale maps can provide. That's why the Alberta Motor Association has been posting directional signage at important rural intersections for many years. Looking for Sheep Camp Picnic Site? Lonesome Pine Road? Figure 8 Lake? They're not on the map, but they're among the 3,500 destinations pointed out by AMA "fingerboards" throughout the province.

Maybe some people consider these signs excellent souvenirs, or maybe they just make good firewood...whatever the reason, vandalism of AMA signs has become a significant and persistent problem. The result is obvious: visitors to rural areas can become lost or inconvenienced without these important signs.

AMA and the Government of Alberta urge you to use and enjoy the province's excellent rural road network, and ask travellers to leave the directional signs intact to point the way for others.

Alberta
Government of Alberta

Alberta Motor Association